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The causal linkage between trade openness and economic growth in Argentina: Evidence from the ARDL and VECM techniques.

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ABSTRACT

The Ricardian-Heckscher-Ohlin trade model drawn from Solow's (1957) model points out that since the country allocates its resources more efficiently after opening up based on its comparative advantages that openness to international trade will bring only a one-time increase in output, therefore having no implications for long-run growth. This led to this study investigating the causal relationship between economic growth and trade openness in Argentina covering the period between 1970 and 2016. Foreign direct investments and capital are incorporated as additional variables to form a multivariate framework. The findings from the ARDL bounds test validated the existence of a long run relationship between economic growth, trade openness, foreign direct investment and capital in Argentina. The results further indicated that there is a long run causality flowing from trade openness, foreign direct investment and capital to economic growth. These results presents a fresh perspective to trade policy makers in Argentina.

JEL Classification: C1, F14, F41, F43

Keywords: Trade Openness; Economic growth; ARDL; VECM; Argentina

1. INTRODUCTION

The nature of the relationship between trade openness and growth has long been a subject of controversy among economists. In the standard neoclassical model of exogenous growth, changes in trade openness can only affect the pattern of product specialisation but not the long-term rate of economic growth. On the other hand, in the new growth theory, changes in trade openness can influence long term rates of economic growth however, the nature of the impact of trade openness on long-term rate of growth when trading partners are structurally different in terms of innovation capabilities is ambiguous.

The relationship between trade openness, foreign direct investment and economic growth has received a great deal of attention both in the theoretical and empirical literature during the last three decades. However, there is no consensus on whether greater trade openness and foreign direct investment stimulates economic growth. A number of studies point to positive economic growth effects of trade openness and foreign direct investment (Musila and Yiheyis (2015), Sakyi and Egyir (2017), Were (2015), Sakyi, Commodore and Opoku (2015), Szkorupová (2014), Sunde (2017)). Whereas other studies contradict the existence of a positive link between trade openness, foreign direct investment and economic growth (Goh, Sam and McNown (2017), Eris and Ulaşan (2013), Hye and Lau (2015)).

Many Latin American economies, in their earlier economic development paths mostly followed protectionist trade policies emphasising the import substitution industrialisation strategy. However, in more recent years, many Latin American countries have experienced major macroeconomic and trade policy reforms with emphasis on market liberalisation and trade openness. Although numerous empirical studies have investigated the long run and causal relationship between trade openness, foreign direct investment and economic growth, few studies focus on specific Latin America countries. Therefore there is greater importance to empirically examine the trade-growth nexus through foreign direct investment and capital in Argentina for the period 1970-2016. The hypothesis to be tested in this study is that trade openness, foreign direct investment and capital has a significant and positive relationship on economic growth in Argentina for the tested period. The study employs the autoregressive distributed lag (ARDL) model to depict the long-run relationship between trade openness, foreign direct investment, capital and economic

growth. Furthermore, the vector error correction model (VECM) is applied to unravel the causal relationships among the variables.

The remainder of the paper is organised as follows. Section 2 provides a review of the theoretical and empirical literature on the relationship between trade openness, foreign direct investment, capital and economic growth. Section 3 presents the model specification and the estimation technique that will be utilised in the study. Section 4 discusses the empirical results. Finally, section 5 summarises the main findings of the study and provides some policy recommendations.

2. LITERATURE REVIEW

The theory of trade and growth developed in two phases, namely; the 1970s with the old growth theory and the late 1980s and early 1990s with the new growth theory. In the 1970s, trade economists explored the old (neoclassical) growth theory in the context of the Ricardian-Heckscher-Ohlin trade model drawn from Solow's (1957) model. This model points out that since the country allocates its resources more efficiently after opening up based on its comparative advantages that openness to international trade will bring only a one-time increase in output, therefore having no implications for long-run growth. The neoclassical growth model implies that output growth rate in the long-run is determined by exogenous technological progress. The traditional Ricardian-Heckscher-Ohlin and the neoclassical growth model failed to provide a theoretical framework for the hypothesis that trade openness may impact the long run growth rate if there is a technology-stimulating effect of trade openness. In this regard, more endogenous growth theories started to pay attention to the implications of trade openness on long-run growth.

On the other hand, the new growth theory (NGT) provides theoretical support for the role of international trade in economic growth. The new growth theory literature suggests two linkages between trade openness and growth, namely: investment and technology. In terms of the investment link, trade openness promotes investment because the traded sector is more capital intensive than the non-traded sector and competition in the international market of machinery and capital equipment lowers the price of capital (Baldwin and Seghezza, 1996:6). Trade openness is also argued to possibly improve technology because a large international market can provide technology spill-over, economies of scale in research and development and higher profits to

innovators (Grossman and Helpman (1990); Romer (1990); Rivera-Batiz and Romer (1991); Coe and Helpman (1995)).

The models of Rivera-Batiz and Romer (1991) and Grossman and Helpman (1991) (cited in Eris and Ulaşan, 2013: 868) provide a theoretical framework linking trade policy to long-run economic growth. According to these models, there are four distinct opportunities that may lead to long run economic growth as a result of openness to international trade:

1. Communication effect: Openness to international trade provides opportunities for communicating with foreign counterparts, which in turn facilitate the transmission of technologies.
2. Duplication effect: Openness encourages firms to invent new ideas and technologies and, consequently, prevent duplication of research and development (R&D) efforts.
3. Integration effect: Trade openness increases the size of the market accessible to firms. Assuming intermediate goods as well as final goods are traded across countries, therefore a larger market size of the R&D sector raises R&D activity and consequently, economic growth as this sector is subject to increasing returns to scale.
4. Allocation effect: Trade openness leads countries to specialise according to comparative advantages that are determined by factor endowments. Relative domestic prices of factors will alter after opening up to trade.

Therefore the influence of trade openness to international trade in the long-run economic growth of a country possibly depends on the magnitude and dominance of these different effects. The existence and nature of the link between trade openness, foreign direct investment, capital and economic growth have been the subject of considerable debate. However, neither the existing theoretical models nor empirical analyses have produced a definite conclusion. The evidence from this literature is mixed and conflicting across methodologies and countries.

Musila and Yiheyis (2015) investigated the effects of trade openness on the level of investment and the rate of economic growth in Kenya. Aggregate trade openness is found to have a positive effect on the level of investment and a statistically insignificant relationship on the rate of economic growth when a number of factors are controlled. Although trade-policy induced openness has a negative and significant affect on investment and the rate of economic growth. The

Granger Causality tests suggested that a change in trade openness influences the long term rate of economic growth through the interaction with physical capital growth.

Fetahi-Vehapi, Sadiku and Petkovski (2015) analysed the effects of trade openness on economic growth of South East European countries for the period 1996 to 2012. The study found that the positive effects of trade openness on economic growth are conditioned by the initial income per capita and other explanatory variables. Moreover, trade openness is more beneficial to countries with higher level of initial income per capita, gross fixed capital formation as well as higher levels of FDI.

Keho (2017) examined the impact of trade openness on economic growth in Cote d'Ivoire over the period 1965 to 2014 using the autoregressive distributed lag (ARDL) bounds test and the Toda and Yamamoto Granger causality tests. The results show that trade openness has a positive effect on economic growth both in the short and long run. Furthermore, the study reveals a positive and strong complementary relationship between trade openness and capital formation in promoting economic growth.

Zahonogo (2016) investigated how trade openness affects economic growth in countries within sub-Saharan Africa (SSA) using a dynamic growth model with data from 42 SSA countries covering the period 1980 to 2012. The empirical results suggest that trade openness may impact growth favourably in the long run, but the effect is not linear. Additionally, the results confirm that trade openness has a positive and significant effect on economic growth only up to a threshold, above which the effect declines.

Kim and Lin (2009) investigated the linkage between trade and economic growth at different stages of economic development in 61 countries for the period 1960 to 2000 using the instrument-variable threshold regressions approach with income as the threshold variable. Empirical results indicate that there exists a significant income threshold in the trade-growth relationship, above which greater trade has a positive effect on growth and below this threshold level, increased trade openness exerts an adverse impact on growth. Additionally, the link of trade to growth is found to work through both capital accumulation and productivity growth channels.

Tsaurai (2017) explored the relationship between financial development, economic growth and trade openness in Argentina for the period 1994 to 2014. The study detected the existence of a

positive but weak uni-directional causality running from financial development through trade openness to economic growth and from economic growth to trade openness in the long run.

Sakyi and Egyir (2017) tested the validity of the Bhagwati hypothesis by investigating the extent to which the interaction of trade (exports) and foreign direct investment (FDI) has had an impact on economic growth for a sample of 45 African countries over the period 1990 to 2014. The Bhagwati hypothesis predicts growth enhancing effects of trade (exports) and FDI interaction. The empirical results reveal support for the Bhagwati hypothesis and shows that in both the short and long run improvements in trade serve as an important channel through which FDI exerts its largest impact on economic growth.

Liu, BurrIDGE and Sinclair (2002) examined the relationship between economic growth, foreign direct investment and trade in China. The study found long run relationship between the variables and a bidirectional causality between economic growth, trade and foreign direct investment.

Sunde (2017) confirmed the FDI-led growth hypothesis by empirically investigating economic growth as a function of foreign direct investment and exports in South Africa. The long run relationship between economic growth, foreign direct investment and exports was tested using the autoregressive distributed lag (ARDL) model. The empirical results confirmed co-integration between economic growth, foreign direct investment and exports. The results indicate that both foreign direct investment and exports stimulate economic growth. The VECM Granger causality analysis found uni-directional causality running from foreign direct investment to economic growth and exports and a bidirectional causality between economic growth and exports.

Szkorupová (2014) investigated the causal relationship between foreign direct investment, economic growth and export in Slovakia for the period 2001-2010. Using the Johansen co integration method and the vector error correction model (VECM) the study found there to be a positive long term relationship between the variables. The results showed that foreign direct investment and exports have a positive impact on economic growth.

Tahir and Azid (2015) examined the relationship between trade openness and economic growth in 50 developing economies for the period 1990 to 2009. The results show trade openness has impacted economic growth positively and significantly in developing countries.

Muhammad and Jian (2016) empirically investigated the relationship between trade openness and economic growth in Muslim countries using the random and fixed effect model. The study found a long run relationship between the variables. Additionally it was found that trade openness has a significant and positive effect on growth.

Were (2015) examined the differential effects of trade on economic growth and investment based on cross country data for the period 1991 to 2011. The results of the study show that whereas trade has positively impacted economic growth in developed and developing countries, its effect is insignificant for least developed countries (LDCs), which largely include African countries. Additionally the results suggest that trade is a key determinant of foreign direct investment across all country groups including LDCs.

Sakya *et al.* (2012) investigated the relationship between trade openness, growth and development for 85 middle income countries for the period 1970 to 2009. The study found that there is a significant long run relationship between trade openness and development. Additionally a bi-directional causality was found between the variables which implies that higher development tends to increase trade openness and vice-versa. On the contrary, a short-run causality between the variables was not found.

Hye and Lau (2015) examined the link between trade openness and economic growth in India. Using the ARDL model and rolling window regression method the study found that human capital and physical capital are positively related to economic growth in the long run. Additionally, the trade openness index impacts negatively on economic growth in the long run and positively in the short run. The result of the granger causality test confirms the validity of trade openness-led growth and human capital-led growth hypothesis in the short run and long run.

Belloumi (2014) investigated the relationship between FDI and economic growth in Tunisia using the ARDL bounds test for the period 1970 to 2008. The results show that there is co integration among the variables specified in the model when FDI is the dependent variable. Furthermore, trade openness and economic growth promote foreign direct investment in Tunisia in the long run. Whereas the results indicate that there is no significant Granger causality from FDI and trade to economic growth or from economic growth to FDI and trade in the short run.

Vogiatzoglou and Nguyen (2016) investigated the economic openness and economic growth for the Asean 5 countries for the period 1980 to 2014. The study found that there is a long-run relationship between economic openness and GDP in all ASEAN-5 economies. Additionally it was found that FDI, imports and exports have a significantly positive long-run impact on the economic growth. On the contrary, a short-run causality between the variables was not found.

Sakyi, Commodore and Opoku (2015) investigated the long run impact of foreign direct investment and trade openness on economic growth in Ghana for the period 1970 to 2011 using the ARDL model. The results validate the Bhagwati hypothesis by suggesting that the interaction of foreign direct investment and exports has been crucial in fostering growth in Ghana.

Moyo, Kolisi and Khobai (2017) investigated the relationship between trade openness and economic growth in Ghana and Nigeria from the period 1980 to 2016. Using the ARDL model the study found a long run relationship among the employed variables for both countries. Furthermore the results showed that trade openness has a positive impact on economic growth and is significant at the 1% significance level in Ghana while in Nigeria trade openness has a negative but insignificant effect on economic growth.

Goh, Sam and McNown (2017) investigated whether there is a long run relationship among foreign direct investment, exports and gross domestic product in selected Asian economies using the bootstrap autoregressive distributed lag (ARDL). The study found no evidence of co integration between the variables.

Gries and Redlin (2012) investigated the relationship between trade openness and economic growth in 158 countries for the period 1970 to 2009. The study found a long-run relationship between trade openness and economic growth. Additionally, a bi-directional causality was found between trade openness and economic growth. By contrast, the short-run coefficient shows a negative short-run adjustment which suggests that trade openness can be painful for an economy undergoing short-term adjustments.

From the literature above, it can be realised that no study was done in Argentina to investigate the long run and causal relationship between trade openness, foreign direct investment, capital and economic growth using the autoregressive distributed lag (ARDL) model and the vector error correction model (VECM). Therefore this study serves to fill the gap.

3. METHODOLOGY

3.1 Model specification

This study serves to investigate the causal relationship between economic growth and trade openness. The study also incorporated foreign direct investment and capital formation as intermittent variables. The foregoing suggest that a general empirical model of trade openness on economic growth can be expressed as follows

$$GDP_t = f(TR_t, FDI_t, K_t) \quad (3.1)$$

All the series are expressed in log-linear form in equation 3.2. This is on account that that log-linear specification provides consistent and reliable results (Shahbaz *et al.*, 2011). As a result, Equation 3.1 can be presented as follows

$$LGDP_t = \alpha + \beta_1 LTR_t + \beta_2 LFDI_t + \beta_3 LK_t + \mu_t \quad (3.2)$$

Where: LGDP stands for natural log of economic growth and it's measured by real GDP per capita, LTR represents the natural log of trade openness, LFDI stands for the natural log of foreign direct investment and LK denotes the natural log of capital formation.

3.2 Data Collection

In tracing the relationship between economic growth and trade openness, the study employs annual data covering the period from 1970 to 2016. In doing so, the gross domestic product (GDP) per capita at 2010 constant prices is used as an indicator for economic growth. Trade openness is the combination of exports and imports. Foreign direct investment is measured as net inflows (BoP, current US\$). Capital is measured as gross capital formation (constant 2010 US\$). All the data was extracted from the World Development Indicators (WDI) published by the World Bank (WB 2016) except for trade openness which was sourced from the United Nations and Trade Development (UNCTAD).

3.3 Unit root

The first step in examining the long run relationship between the variables is to test whether the variables are stationary or non-stationary. This study uses three unit root tests; Augmented Dickey Fuller (ADF) unit root test by Said and Dickey (1984), Phillips-Perron (PP) unit root test by

Phillips and Perron (1988) and the Dickey Fuller Generalised Least Squares (DF-GLS) test proposed by Elliot, Rothenberg and Stock (1996). The ADF and the Phillips-Perron tests have been criticised for their low power when variables are stationary but with a root close to non-stationary boundary (Brooks, 2014). Elliot *et al.* (1996) argue that the DF-GLS test has more power in the presence of an unknown mean or trend compared to the ADF and the Phillips-Perron tests. The null of a unit root is tested against the alternative of stationarity in all tests.

3.4 Co-integration test

To examine the long run relationships between economic growth, trade openness, foreign direct investment and capital formation, the bounds test for co-integration within the autoregressive distributed lag (ARDL) modelling technique is employed in this study. This model was developed by Pesaran *et al.* (2001) and can be applied regardless of the order of integration of the variables (irrespective whether regressors are purely I(0), purely I(1) or mutually co-integrated). In simple form, the ARDL model involves estimating the following conditional error correction models:

$$\begin{aligned}\Delta LGDP_t = & \alpha_1 + \alpha_T T + \alpha_{GDP} LGDP_{t-1} + \alpha_{TR} LTR_{t-1} + \alpha_{FDI} LFDI_{t-1} + \alpha_K LK_{t-1} + \sum_{i=1}^p \alpha_i \Delta LGDP_{t-i} \\ & + \sum_{j=0}^q \alpha_j \Delta LTR_{t-j} + \sum_{k=0}^r \alpha_k \Delta LFDI_{t-k} + \sum_{m=0}^t \alpha_m \Delta LK_{t-m} + \varepsilon_{1t}\end{aligned}$$

$$\begin{aligned}\Delta LTR_t = & \alpha_2 + \alpha_T T + \alpha_{GDP} LGDP_{t-1} + \alpha_{TR} LTR_{t-1} + \alpha_{FDI} LFDI_{t-1} + \alpha_K LK_{t-1} + \sum_{i=1}^p \alpha_i \Delta LGDP_{t-i} \\ & + \sum_{j=0}^q \alpha_j \Delta LTR_{t-j} + \sum_{k=0}^r \alpha_k \Delta LFDI_{t-k} + \sum_{m=0}^t \alpha_m \Delta LK_{t-m} + \varepsilon_{2t}\end{aligned}$$

$$\begin{aligned}\Delta LFDI_t = & \alpha_3 + \alpha_T T + \alpha_{GDP} LGDP_{t-1} + \alpha_{TR} LTR_{t-1} + \alpha_{FDI} LFDI_{t-1} + \alpha_K LK_{t-1} + \sum_{i=1}^p \alpha_i \Delta LGDP_{t-i} \\ & + \sum_{j=0}^q \alpha_j \Delta LTR_{t-j} + \sum_{k=0}^r \alpha_k \Delta LFDI_{t-k} + \sum_{m=0}^t \alpha_m \Delta LK_{t-m} + \varepsilon_{3t}\end{aligned}$$

$$\begin{aligned}\Delta LK_t = & \alpha_4 + \alpha_T T + \alpha_{GDP} LGDP_{t-1} + \alpha_{TR} LTR_{t-1} + \alpha_{FDI} LFDI_{t-1} + \alpha_K LK_{t-1} + \sum_{i=1}^p \alpha_i \Delta LGDP_{t-i} \\ & + \sum_{j=0}^q \alpha_j \Delta LTR_{t-j} + \sum_{k=0}^r \alpha_k \Delta LFDI_{t-k} + \sum_{m=0}^t \alpha_m \Delta LK_{t-m} + \varepsilon_{4t}\end{aligned}$$

Where:

$LGDP_t$ is the natural logarithm of Gross Domestic Product,

LTR_t is the natural logarithm of trade openness,

$LFDI_t$ is the natural logarithm of foreign direct investment

LK_t is the natural logarithm of capital formation.

T represents the time period,

Δ represents the first difference operator,

It is assumed that the residuals ($\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, \varepsilon_{4t}, \varepsilon_{5t}$) are normally distributed and white noise

The bound test procedure is based on the F-test for examining the existence of the long run relationship and it tests for the joint significance of lagged level variables involved. The null hypothesis of nonexistence of cointegration for the equation is as follows; $H_0: \alpha_{GDP} = \alpha_{TR} = \alpha_{FDI} = \alpha_K = 0$ tested against the alternation hypothesis $H_1: \alpha_{GDP} \neq \alpha_{TR} \neq \alpha_{FDI} \neq \alpha_K \neq 0$. If the calculated F-statistics exceeds the upper critical bound value, then the H_0 is rejected and the results conclude in favour of co-integration. On the contrary, H_0 cannot be rejected if the F-statistics falls below the lower critical bound value. Finally, if the F-statistics falls within the two bounds, then the co-integration test becomes inconclusive.

3.5 Granger-causality

The next stage of the analysis, the vector error correction model (VECM) analysis investigate the long run and short run causality between trade openness and economic growth. Time series X Granger-causes times series Y if the prediction error of series Y changes based on the previous value of X and Y. The VECM can be moulded as follows:

$$\begin{aligned}\Delta LGDP_t &= \alpha_{10} + \sum_{i=1}^q \alpha_{11} \Delta LGDP_{t-i} + \sum_{i=1}^r \alpha_{12} \Delta LTR_{t-i} + \sum_{i=1}^s \alpha_{13} \Delta LFDI_{t-i} + \sum_{i=1}^t \alpha_{14} \Delta LK_{t-i} + \\ &+ \psi_1 ECT_{t-1} + \varepsilon_{1t} \\ \Delta LTR_t &= \alpha_{20} + \sum_{i=1}^q \alpha_{21} \Delta LGDP_{t-i} + \sum_{i=1}^r \alpha_{22} \Delta LTR_{t-i} + \sum_{i=1}^s \alpha_{23} \Delta LFDI_{t-i} + \sum_{i=1}^t \alpha_{24} \Delta LK_{t-i} + \\ &+ \psi_2 ECT_{t-1} + \varepsilon_{2t}\end{aligned}$$

$$\Delta LFDI_t = \alpha_{30} + \sum_{i=1}^q \alpha_{31} \Delta LGDP_{t-i} + \sum_{i=1}^r \alpha_{32} \Delta LTR_{t-i} + \sum_{i=1}^s \alpha_{33} \Delta LFDI_{t-i} + \sum_{i=1}^t \alpha_{34} \Delta LK_{t-i} +$$

$$+ \psi_3 ECT_{t-1} + \varepsilon_{3t}$$

$$\Delta LFDI_t = \alpha_{40} + \sum_{i=1}^q \alpha_{41} \Delta LGDP_{t-i} + \sum_{i=1}^r \alpha_{42} \Delta LTR_{t-i} + \sum_{i=1}^s \alpha_{43} \Delta LFDI_{t-i} + \sum_{i=1}^t \alpha_{44} \Delta LK_{t-i} +$$

$$+ \psi_4 ECT_{t-1} + \varepsilon_{4t}$$

Δ denotes the difference operator, α_{it} is the constant term and ECT represents the error correction term derived from the long run cointegrating relationships. The t-statistics is employed to test the significance of the speed of adjustment in ECT terms. The statistical significance of ECT_{t-1} with a negative sign validates the existence of a long run causality flowing among the variables. To investigate the short run causality, the Wald test is applied on differenced and lagged differenced terms of the independent variables.

4. FINDINGS OF THE STUDY

4.1 Unit root tests

In accordance to the recent development in time series modeling, unit root test is basically required to determine whether the time series have stationary trend and if non-stationary and the number of times the variables has to be differenced to arrive at a stationary. The Augmented Dickey Fuller, Phillips and Perron and Dickey Fuller Generalised Least Squares unit root tests for the four variables are employed to test for stationarity. The results are presented in Table 1. The results showed that the null hypothesis is accepted at levels indicating that all the variables are non-stationary at level form. But at first order unit root differencing the variables became stationary (see Table 1). Hence, all the variables are integrated of first order, $I(1)$.

Table 1: Unit root tests

	Levels			First difference		
Variable	ADF	PP	DF-GLS	ADF	PP	DF-GLS
LGDP	-2.5460	-2.0727	-2.5619	-5.6681*	-5.5856*	-5.6190*
LTR	-2.6298	-2.4145	-2.6420	-5.2104*	-5.2195*	-5.6190*
LFDI	-3.0700	-3.0614	-3.1066	-7.6531*	-12.1424*	-7.7188*
LK	-2.6854	-2.3716	-2.2289	-5.6189*	-5.8947*	-5.6190*

Source: Own calculation

Prior to examining the co-integration among the variables, it is necessary to determine the optimal lag length. In the ARDL model, the optimal lag lengths for the independent variables can be selected based on the Akaike information criterion (AIC) or the Schwarz Bayesian Criterion (SBC) by searching across $(p+1)^k$ ARDL models. The smaller value of AIC or SBC is a better result. In this paper both AIC and SBC are employed to decide the optimal lag lengths for the ARDL model. The results are illustrated in Table 4.2 and show that the optimal lag length $p^*=1$ is chosen.

4.2 Co-integration

Table 4.2 Selection order criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	116.2058	NA	3.20e-08	-5.905570	-5.733192	-5.844239
1	268.9083	265.2201*	2.42e-11*	-13.10044*	-12.23855*	-12.79378*
2	275.8257	10.55806	4.02e-11	-12.62240	-11.07101	-12.07043
3	294.4090	24.45179	3.79e-11	-12.75837	-10.51746	-11.96107
4	307.9310	14.94530	5.06e-11	-12.62795	-9.697528	-11.58533

Source: own calculation

To examine the presence of a long run relationship among the variables the ARDL bounds technique is used and the results are illustrated in Table 4.3. Table 4.3 shows that when trade openness is used as the dependent variable, the computed F-statistic is less than the lower critical value bounds at 5% level of significance. This implies that there is no long run relationship when trade openness is used as the dependent variable. On the contrary, Table 4.3 indicates that when economic growth, foreign direct investment and capital are used as the dependent variables, the

computed F-statistics fall outside the critical value bounds at 5 per cent level of significance. This implies that the null hypothesis of no co-integration among the variables can be rejected. This means that there are three co-integrating equations. These results are consistent to Sunde (2017), Szkorupová (2014) and Moyo, Kolisi and Khobai (2017).

Table 4.3 ARDL Co-Integration Test

Critical value bound of the F-statistic						
K	90% level		95% level		99% level	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
3	2.022	3.112	2.459	3.625	3.372	4.797
4	1.919	3.016	2.282	3.340	3.061	4.486
<u>Calculated F-statistics</u>						
$F_{GDP}(GDP/TR, FDI, K) = 5.01$ $F_{TR}(TR/GDP, FDI, K) = 2.15$ $F_{FDI}(FDI/GDP, TR, K) = 4.35$ $F_K(K/GDP, TR, FDI) = 7.23$						
Note: The critical bound values were taken from Narayan and Smyth (2005: 470)						

Since the study has established that there is a long run relationship among the variables, the next step is to conduct an estimation of the long run relationship among the variables. The econometric results for the long run model are illustrated in Table 4.4. Table 4.4 shows that trade openness, foreign direct investment and capital have a positive and a significant effect on economic growth in the long run. More specifically, a 1 percent increase in trade openness boosts economic growth by 0.077 percent, all else held constant. Similarly, a 1 percent increase in foreign direct investment leads to an increase of 0.013 percent in economic growth, ceteris paribus. Lastly, a 1 percent increase in capital enhances economic growth by approximately 0.34 percent, all else held constant. These results are consistent to Keho (2017), Fetahi-Vehapi, Sadiku and Petkovski (2015) and Zahonogo (2016).

Table 4.4 Long run results

Dependent Variable = LGDP			
Long Term Results			
Variable	Coefficients	Standard Error	T-statistics
Constant	0.85***	0.4544	1.8772
LTR	0.077**	0.0361	2.1324
LFDI	0.013**	0.0058	2.2327
LK	0.34*	0.2342	14.6692
R-squared 0.92			
Durbin Watson Stat 2.10			

Source: Own calculations

The short run dynamics are displayed in Table 4.5. The findings posit that trade openness has a positive effect on economic growth but is insignificant at 5 percent level of significance. Moreover, Table 4.5 shows foreign direct investment and capital have a positive and significant effect on economic growth in the short run. Specifically a 1 percent increase in foreign direct investment leads to an increase of 0.014 percent increase in economic growth, *ceteris paribus*. Lastly, a 1 percent increase in capital causes economic growth to increase by approximately 0.32 percent, *ceteris paribus*. These results are consistent to Sakyi and Egyir (2017), Muhammad and Jian (2016) and Tahir and Azid (2015).

In order to determine the robustness of the short run dynamics from the ARDL model and to recheck the existence of the long run relationship established in the ARDL model, the error correction model is estimated and its results are displayed in Table 4.5. The estimated coefficient of the ECM_{t-1} is -0.12 is negative and significant, which implies that the results support the existence of a long run relationship among the variables. It also indicates that departure from long term growth path due to a certain shock is adjusted by 12% each quarter.

Table 4.5 Short run analysis

Variable	Coefficient	Standard error	T-statistics
LTR	0.03	0.0542	0.5638
LFDI	0.014*	0.0043	3.3133
LK	0.32*	0.0331	9.7735
ECM _{t-1}	-0.12*	0.0258	9.7735
R ²	0.92		
D.W test	2.10		
*represent 1%, significance level			

Source: Own calculation

The diagnostic tests results are displayed in Table 4.6. It was confirmed that the error terms of the short run models are free of heteroskedasticity, have no serial correlation and are normally distributed. It was also established that the Durbin Watson statistics is greater than the R^2 , which means that the short run models are not spurious

Table 4.6 Short-run diagnostics

Short run diagnostics		
Test	F-statistics	P-value
Normality	0.414	0.8128
Heteroskedasticity	0.654	0.7471
Serial correlation	0.722	0.4954

The stability of the long run parameters were tested using the cumulative sum of recursive residuals (CUSUM) and CUSUM of recursive squares (CUSUMSQ). The results are illustrated in Figures 4.1 and 4.2. The results fail to reject the null hypothesis at 5 percent level of significance because the plot of the tests fall within the critical limits. Therefore, it can be realised that our selected ARDL model is stable.

Figure 4.1 CUSUM

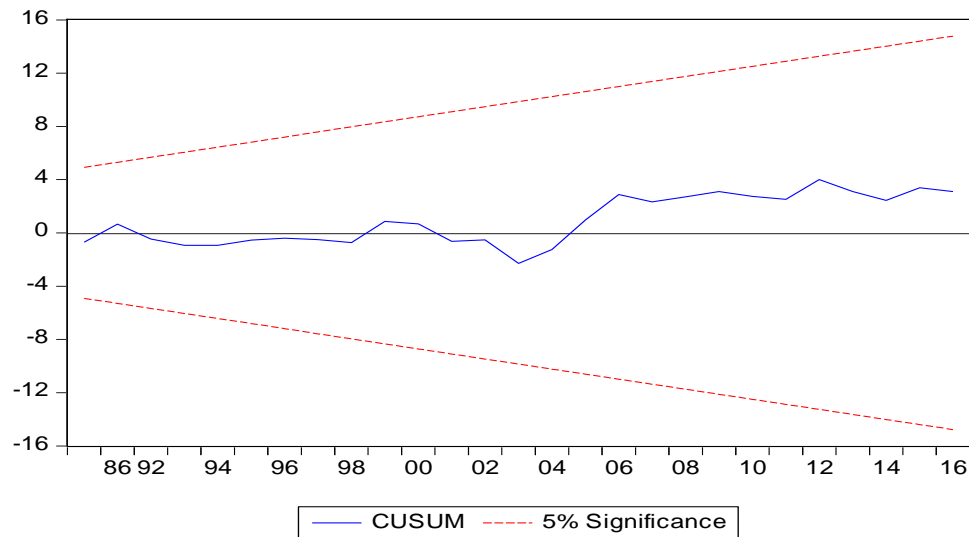
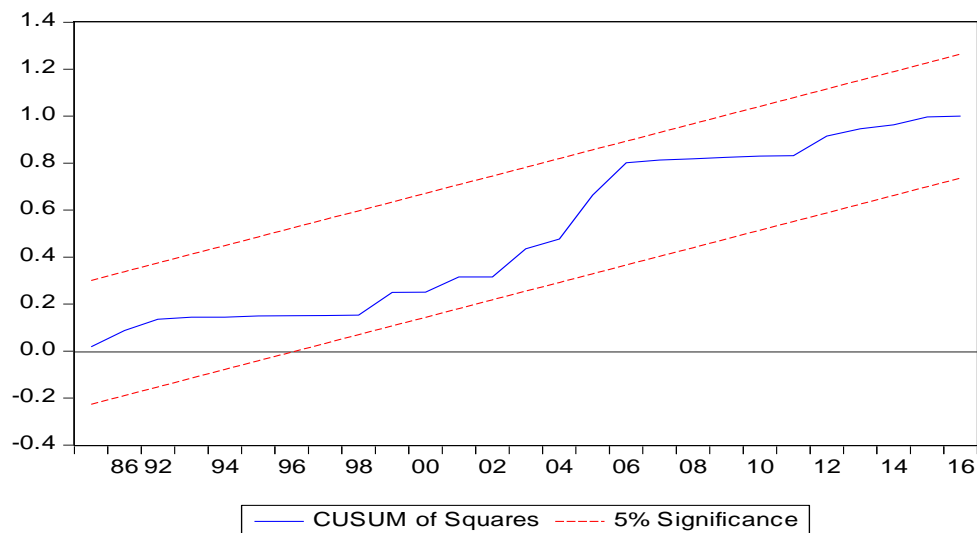


Figure 4.2 CUSUMSQ



4.3 Granger Causality

After confirming the presence of a long run relationship between the variables, the VECM Granger-causality approach is used to examine the direction of causality between economic growth, trade openness, foreign direct investment and capital. The results for the long run and short run causalities are illustrated in Table 4.7.

Commencing with the short run results, it was confirmed that there is a weak causality flowing from foreign direct investment to economic growth. The results further detected that foreign direct investment Granger-causes trade openness and capital in the short run. No short run causality was established flowing either from economic growth to trade openness or from trade openness to economic growth in the short run. These results are consistent to Vogiatzoglou and Nguyen (2016) and Sakyi *et al.* (2012).

Table 4.7 Vector Error Correction Model (VECM)

Dependent variable	Types of Causality)				
	Short run				Long run
	$\sum \Delta Lgdp$	$\sum \Delta ltr$	$\sum \Delta lfdi$	$\sum \Delta k$	ECT_{t-1}
$\Delta Lgdp$	.....	1.089	2.652***	0.097	-0.312**
Δltr	0.803	.....	2.943**	0.114	0.357
$\Delta lfdi$	0.074	1.946	.....	0.869	4.089
Δk	0.319	1.503	5.259*	.....	1.163

Source: Own calculation

When economic growth is used as the dependent variable, the results validate the existence of a long run causality flowing from trade openness, foreign direct investment and capital to economic growth. This is on account that the error correction term (-0.312) is negative and significant at 5 percent level of significance. These results are consistent to Hye and Lau (2015), Liu, BurrIDGE and Sinclair (2002), Tsaurai (2017) and Gries and Redlin (2012).

4. CONCLUSION

This study investigated the linkage between economic growth and trade openness and incorporated foreign direct investments and capital formation as additional variables to form a multivariate framework. The annual data covering the period between 1970 and 2016 for Argentina was used. To examine the presence of a long run relationship between economic growth and trade openness, the ARDL bounds test was employed while the VECM technique was used to determine the direction of a causal relationship among the variables.

The ARDL bounds tests established that there is a long run relationship between the variables. The results reported that trade openness has a positive and a significant effect on economic growth in the long run. Specifically, it was found that a 1 percent increase in trade openness boots economic growth by 0.077 percent. Moreover, foreign direct investment and capital formation were found to boost economic growth in the long run. The VECM results validated there is a uni-directional causality flowing from trade openness, foreign direct investment and capital formation to economic growth. This implies that trade openness plays a major role in boosting economic growth in Argentina. The policy implications in this study are relatively simple. Argentina needs better policies towards the promotion of export for non-traditional goods and equally importantly to ensure that the produced goods are able to compete internationally. Furthermore, improved trade policy reforms to eradicate many trade restrictions that exporters encounter, lower trade tariffs and moving towards liberalisation should be adopted.

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